RUSSIAN AVIATION INDUSTRY TRENDS

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> The defense marketplace would soon consist of one gorilla, two chimpanzees and six marmosets.[1]
>
> In the year 2054, the entire defense budget of the United States will purchase one aircraft. The aircraft will have to be shared by the Air Force and Navy three and a half days each per week except for the leap year, when it will be made available to the Marines for the extra day.[2]

INTRODUCTION

Defence efforts, especially by major states, have undergone substantial changes in recent times. A few indicators are in order for illustration. Global military expenditure that stood at the peak in the year 1987, witnessed drastic reductions throughout till the late 1990s, only to go up again since 1998-99. The trend in increase in military expenditure is likely to continue well into the future as, especially since 9/11 and the consequent war on terrorism, the United States has been devoting more and more money for security purposes. Trends in global investments in military research and development (R&D) show similar patterns—drastic reductions during the late 1980s till the late 1990s and determined increase thereafter[3]. Trends in

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1. As quoted by Bill Anders, the former head of the American defence manufacturer General Dynamics, cited in John J. Dowdy, "Winners and Losers in the Arms Industry Downturn," *Foreign Policy*, no. 107, Summer 1997, p. 90.
2. Quoted by Norman Augustine, a top US corporate executive, cited in Ajay Singh, "Quest for Self-Reliance," in Jasjit Singh, ed., *India's Defence Expenditure: Assessing Future Trends* (New Delhi: Knowledge World and Institute for Defence Studies and Analyses, 2000), p. 138.
3. Data on indicators like military expenditure, arms production, expenditure in military R&D, arms transfers and others are published annually by Stockholm International Peace Research Institute (SIPRI). For data and detailed analyses on the above for the last five years and changes in percentage terms, see *SIPRI Yearbook 2004* (Oxford: Oxford University Press, 2004).

production of military weapons and trade have also witnessed similar patterns of development. Efforts to undertake reforms within armed forces by many countries, in terms of both force modernisation and restructuring, have also been taking place. In sum, the trends in the international security scenario suggest major changes in defence efforts by countries.

The most visible among the major changes witnessed in the security spheres of activity in recent times is the nature and behaviour of the defence industry. Thanks primarily to the above-mentioned trends, the defence industry has faced unprecedented challenges during the post-Cold War era that are marked, among others, by reduced demand for military weaponry, less investment in defence production, shrinking of the exports market, loss of manpower and still less investment in military R&D. To cope with such challenges, the defence industries of major countries have adopted several strategies—for example, while countries like the United States and countries of West Europe have carried out comprehensive restructuring programmes through concentration, consolidation, diversification and conversion, other players like Russia and China have grappled not only with the current changes at a global scale but also faced challenges arising primarily out of inherent domestic compulsions of transitions from a command economic structure to a more globalised market friendly environment. In brief, the restructuring of the global defence industry represents one of the most dramatic transformations in contemporary times, typified by at least two contrasting pointers—while once sacrosanct notions of autarky in arms production (defined in terms of exclusively national efforts in defence and, hence, the defence industry being regarded more as "national assets" than one more manufacturing sector) is slowly paving the way for more internationalisation in terms of development of production and marketing of military weaponry; at the same time, the shrinking size of the defence industry with its associated trends suggests that it is increasingly being dominated by defence industrial giants, leaving the medium and small size industrial units to either opt for mergers with big brothers or move out of

arms production. The global security environment has, thus, not been friendly to the weapons emporium or to the local weapons producer[4].

Perhaps the most dramatic changes that have occurred in recent times point to the restructuring of the aerospace industry. "From what was over 70 suppliers in 1980, it is down to five prime contractors today"—is what a major Commission Report on the status of the US aerospace industry says[5]. The scenario in Europe tells almost a similar story: "Companies in the aerospace industry in Europe are rethinking their strategic positions…I am sure that there will be further consolidation in Europe," opines Rainer Hertrich, co-chief executive officer of European Aeronautics Defence and Space Company (EADS)[6]. The same trends in consolidation efforts in the aerospace sector are continuing in almost all major manufacturing countries.

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The Russian defence industry has been witnessing major changes, especially since the break-up of the Soviet Union in 1991. It has, thus far been struggling to not only adjust to the new international environment but also been faced with numerous challenges as well as difficulties from within. While reforms within the defence industry are still under way that have

4. See "Introduction" in Ifraim Inbar and Benzion Zilberfarb, eds., *The Politics and Economics of Defence Industries* (London: Frank Cass, 1998), p. xiii.

5. For a detailed analysis and status of the US aerospace industry, see Report of the Commission on the Future of the US Aerospace Industry, report submitted on November 18, 2002, to the president of the United States and the Congress of the United States. Copy of the report is available at <http://www.ita.doc.gov/td/aerospace/aerospacecommission/AeroCommissionfinalreport.pdf>

6. For an excellent study on the aerospace industry in Europe, see "Restructuring the Global Aerospace Industry," Report prepared by A.T. Kearney, Inc., a renowned US based consulting firm, available at <http://www.atkearney.com/shared_res/PDF/Restructuring_aerospace_Ind_S.pdf> Also, see <http://www.europa.eu.int/comm/enterprise/aerospace/index.htm>

addressed both structural and organisational problems of varied magnitude, it is argued that unless both political and industrial leaderships devise long-term revival and prosperity agendas for this important sector, problems are likely to remain. This paper examines the trends in the Russian defence industry and tries to explain the broad contours of its contemporary status in the international context. The paper starts with a broad historiography of the evolution and development of the defence industry, goes on to examine it in the context of overall defence industrial reforms undertaken during the past one decade or so after the disintegration of the Soviet Union and tries to give clues to future trends. It argues that the current restructuring process in the Russian defence industry is yet to bear the desired fruit. It also argues that indicators of revival are showing positive tendencies and predict that restructuring of the Russian defence industry cannot be undertaken in isolation, suggesting that there could be more international joint ventures in the offing, leading not only to sectoral consolidation within the defence industry but also substantial internationalisation efforts that could benefit sectors like aerospace.

THE RUSSIAN DEFENCE INDUSTRY: A HISTORIOGRAPHY

The Russian military leadership recognised the significance of aircraft for warfare at an early date. A training centre for pilots was established at Gatshina in 1910, followed by the first flight meeting a couple of years later in Russia. Small numbers of aircraft were procured from France and Britain and soon Russian enterprises became interested in making aircraft. The Russko-Baltiskovo Vagonovo Zavod (Russo-Baltic Railway Car Plant) at St. Petersburg and the Shchetinin commenced production of aircraft. By 1914, no fewer than 329 aircraft had been manufactured[7]. By this time, although famous Russian engineers like Igor T. Sikorsky, Yakov M. Gakkel and Dmitri P. Grigorovich had started designing aircraft, aviation technology was generally imported in an unsystematic manner from a variety of sources.

7. For a historical overview of the Soviet defence industry, see Ulrich Albrecht, *The Soviet Armaments Industry* (Opladen, Germany: Harwood Academic Publishers; 1989). This figure is cited on p. 8.

Table 1: Transfers of Select Aviation Equipment to the USSR

Year	Category	Producer/ Designation	Country of Origin	Comment
1918	Fighter	SPAD 7	France	Built under licence at Dux Works, Moscow
1919	Fighter	F-4 , F-2B	France	
1921	Fighter	Fokker D.XI / D.XIII	Netherlands	
1921	Reconnaissance	Fokker C.IV	Netherlands	
1922	Amphibian	NT. 2B	UK	
1923	Fighter	Junkers	Germany	Various types
1923	Fighter	Savoia S.1 BIS	Italy	
1926 1924	Bomber	F-62	France	Serial production in
1927	Bomber	Junkers K-30	Germany	
1930	Hydroplane	Heinkel HD 55	Germany	Built under licence at Leningrad
1932	Fighter	HD 37	Germany	Built at Polikarpov I-7
1935	Northrop 2-E	USA		
1937	Fighter	Seversky 2-PA	USA	
1937	Transport	Douglas DC-3	USA	Under licence as Li-2
1940	Fighter	HE-100, ME-109	Germany	
1947	Jet power plants	Rolls Royce	UK	
1960	Helicopters	S-58, Vertol 44	USA	

Source: Ulrich Albrecht, *The Soviet Armaments Industry* (Opladen, Germany: Harwood Publishers, 1989), pp. 10-11.

After the October Revolution, the Soviets undertook a series of licensing programmes, most prominent among which was the SPAD S-7 fighter aircraft, then a quality product of the French Societe Pour Production les Apparailles Deperdussin—(SPAD) which granted licensing rights and technical support to the Soviet government for serial production. During this time, many of the European aircraft manufacturers were under tremendous financial difficulties and thus were keen to fulfill the Soviet demand for arms, which opportunity the Soviets fully exploited. The Netherlands sold 200 Fokker D

XI fighters and reconnaissance planes.[8] Several hundred Ansaldo (manufactured by Corpo Aeronautico Militare of Italy) reconnaissance aircraft, and DeHavilland DH-9 (Soviet designation R-1) were either procured or manufactured by the Soviets[9]. The first Soviet trainer, U-1, entered production in 1920. These acquisitions and both authorised and unauthorised production opened up a steady flow of technologies, which the Soviets fully exploited.

Formidable military-technological cooperation between Soviet Russia and the German Reich during the whole of the 1920s marked the commencement of the Soviet efforts to build up an indigenous technology base, although a steady flow of technology transfers from other countries continued during the same period. Private industry like the Junkers Flugzeug-und Motorenwerke, A.G. of Dessau played a decisive role in the development of Soviet aircraft construction. Junkers produced a range of military planes, among which the K-30 three engine bomber and the A-20 armed reconnaissance plane stand out. It was also during this time that advanced military hardware that was brought from abroad was not only copied but also adapted to local conditions by means of add-on engineering. This process, in fact, commenced with the Junkers Ju-20 programme, when a set of alternative engines was tried.[10] However, transfer of technology to benefit indigenous industry did not happen till this time.

The first Soviet aircraft design bureau was established in 1925 and was headed by Tupolev. After a few years, especially since the early 1930s, the Soviet Air Force was equipped with aircraft of domestic origin. During this time, Soviet authorities tried to improve the technological level of their armaments industry by a combination of strategies—inviting foreign experts for guidance as well as sending native designers abroad to gain knowledge on specific technologies. Sergei A. Kocherigin, N.N. Polikarpov, P.O. Sukhoi and Ilyushin were prominent figures in such endeavour, while the

8. For a detailed description of the status of the contemporary defence industry, especially in the aviation sector, see William Green and John Fricker, *The Air Forces of the World: Their History, Development and Present Strength* (London: MacDonald Publishers, 1958). Also see, n. 7, pp. 8–53.
9. Ibid., p. 9.
10. Ibid., p. 13.

involvement of American firms for the first time was noticed. Designers like Lizunov spent time in the United States while other scientists like Artyem I. Mikoyan and Vladimir Myazishchyev and others diligently started reworking on American DC-3 aircraft. Also of considerable help was the cumulative knowledge that some American scientists like Alfred Sarant and Joel Barr brought with them to Russia in the 1940s.

Since the end of World War II, Soviet aviation experts have also been visiting several countries and are said to be regulars at various air shows. Apart from these, designers like Tupolev were determined to improve upon existing models and the foremost in their minds was to make a super bomber like the Boeing B-29. Tupolev worked for quite some time to make the Tu-4 which had its first test flight in 1947. By the late 1950s, more than 300 Tu-4 were ready for deployment. Tupolev went on to make two subsequent models—the Tu-80 and Tu-85. Roughly at this time, the MiG team and the Sukhoi team were instructed in parallel to build the first Soviet jet fighter. And, the Yak-15 followed soon after. From here commenced the journey of long range bombers and other improvised or new models of hypersonic and supersonic fighters.

Like the development of the aircraft industry, other military technologies like tanks, missiles, naval equipment were strongly influenced by the West. The first lines of design came from Vickers Carden, and soon the USSR started producing T-27 tanks under licence in the late 1920s. During the same time, Renault M17/18 were manufactured at the Krasnoye Sormovo plant at Gorky. The six-ton T-26/Vickers and the BT/Christie tanks formed most of the Soviet tank force in the 1930s and early 1940s. Apart from tanks, German technical assistance in the production of ammunition at Petrograd, Tula and Zlatoust plants followed during this time to supplement the Soviet land-based forces. A key feature of the Soviet military industrial system points to the fact that single individuals as main designers of specific military technologies have been responsible for the main tasks that they are given for a lifetime. For example, after the death of the famous tank designer, Koshkin, Alexandr Morosov was the chief designer of the main battle tank design

from 1940 to 1979. Under his directions, improved versions of the T- series tanks, from the T-34 till T-72 were produced[11]. The top Soviet tanks of the past three decades, including the T-64 and T-80 were developed under the design leadership of Nikolai Shomin.

Apart from the evolution and development of land-based and air-based weapon systems, the two most important technological endeavours centred round atomic weapons and development of long range missiles. The successful design of long range missiles represents the most spectacular achievement of the Soviet defence industry. Although there are opposite views about the development of missile technologies as indigenous or sourced and consequent adoption to local needs from abroad, the story of Russian missile technologies is certainly noteworthy[12]. A significant boost in the missile sector came from the Germans during the 1940s and it was around this time that the German V-2 (Russian name R-1) was manufactured in the USSR. The SS class followed soon. In 1948, the first test firing of an innovative combustion chamber for the SS-2 was carried out. The bigger range missile R-14 soon came up. After a long period of development of the various short, medium and long range missiles throughout the Cold War period, it can fairly be argued that missile technologies have matured quite fast after initial setbacks during the 1940s and 1950s. In fact, there is limited public information available about the actual production sites for the Russian missiles. The principal production facility for the SS-20 is at the Votkinsk Machine Building Plant in the Udmurt, while launchers for the missiles are produced at the Barrikady Plant, Volgograd. Yushnoe Production Association had been in charge of production for four generations of strategic missiles. This association comprised the Yusknoe OKB, the Yushnuy Mashinostroitelnuy (Southern Machine Building Plant) and a scientific centre for the development of production technology.

11. Ibid., pp. 69-71.

12. For details about the origin and development of Soviet missile technologies and industry, see Chris Bellamy, *Red God of War: Soviet Artillery and Rocket Forces* (London: Brasseys, 1986). Also, see R. Amann and Julian Cooper, *Industrial Innovation in the Soviet Union* (London: Macmillan, 1982).

The Russian naval technology was developed since the early decades of the 20th century. Like in other sectors, German assistance was critical in the formative years of naval technology development in Russia. By the early 1940s, the Soviet submarine force numbered more than 200—forming the largest fleet in the world. According to *Jane's Fighting Ships*, the Soviets had, since around 1950, worked on nuclear propulsion for naval use[13]. The first reactor for a submarine was available in 1953, while the first serial nuclear submarine was commissioned in 1958. In contemporary times, the Russians produce the largest submersibles. A Typhoon class SSBN is considered a prized possession of the Russian Navy. This class of SSBN is produced at the Zvezdochka (Yard No. 402) at Severodvinsk on the White Sea. The submarine industry is part of the Ministry of Shipbuilding Industry. The development of the new submarines is carried out by three ministerial design bureaus, called TsKBs (central construction offices). TsKB 16, 18 and 143 are all located in Leningrad. Apart from submarine construction, heavy warship technology was the most recent, with the construction of aircraft carriers. Admiral Gorshkov's story is well known

THE RISE OF THE SOVIET DEFENCE INDUSTRIAL COMPLEX

The evolution and development of the Russian defence industry before and after World War II, especially after the commencement of the Communist rule have followed a difficult path. The preceding narration suggests that it has taken both the vertical and horizontal development paths—while product development and acquisitions of requisite aviation technologies from a variety of sources have followed the former, the industrial plants devoted to production of complete or sub-systems have followed the latter. Critical to our understanding of the Russian defence industry, however, is the need to understand the complicated governmental or institutional framework in which it has evolved over the decades. This may provide a set of clues to not only understand the Russian system but also to how to respond to the challenges and opportunities emerging from such a system that may come

13. *Jane's Fighting Ships 1987-88*, p. 545.

Table 2: The Organisation of the Soviet Defence Sector in 1985

Politburo CPSU						
	CPSU Central Committee Secretariat			Defence Council USSR		
Political administration of Army and Navy	CS Secretariat of Heavy and Defence Industry			Council of Ministers USSR		
Ministry of Defence	Main Military Council & General Staff		Gossnab Gosplan	Military Industrial Commission	State Commission for S&T Academy of Sciences	State Economic Relations
Other troops Spetsnaz Navy Ground Forces Air Defence Air Force Strategic Rocket Forces MoD units Border Guards Internal Troops Non-MoD Units	Main Armaments Directorate Units for storage, distribution and maintenance of weapons	Rear Services Directorates of food, fuel, clothing, housing Units for storage, distribution and maintenance of other goods		Defence Industry Ministries Aviation Communication Equipment Defence Electronics General Machine Building Machine Building Medium Machine Building Radio Shipbuilding Defence Firms Electrical Equipment Petroleum & Chemicals DI Institutes		

Source: Christopher Davis, "Country Survey XVI: The Defence Sector in the Economy of a Declining Super Power: Soviet Union and Russia, 1965—2001," *Defence and Peace Economics*, vol. 13, no. 3, June 2002, p. 149.

from time to time. A short narration of the Soviet system in relation to its defence industry existent prior to the pre-1991 period is given here for the said purpose.

The organisation of ministries in the Soviet system is different from that of any Western Cabinet system for obvious reasons. Within the Soviet system (hereafter referred so till the break-up of the USSR), the defence industrial group consisted of nine ministries, which formed a segment within the cluster of other industrial ministries (Ministerstva Oboronnych Otraslei Promyshlennosti, MOOP), recently also called "The Defence Complex." Typically, a ministry is in charge of one branch of production, e.g. heavy machine-building[14]. The ministry is also responsible for various design bureau and production factories. The directors of the research institutions and factories are appointed by the minister. If the requirement (for a new weapon) is based on a proposal by a designer who does not head at least a branch, the minister may decide to set up a new department with the project's author as the chief designer.

The institutional structure of the Soviet defence industrial sector has changed considerably over the years, with the introduction of substantial modifications which were mainly connected with larger scale reorganisation efforts within the Soviet government. In the past, most production plants were directed by a ministry. The ministries themselves were organised according to branches of industrial activities. Because of the nature of military technology and the related structures of industry change, new industries such as nuclear or space industries have emerged. Thus, the institutional set-up of the various ministries engaged in defence production had to adapt much more to these processes than is the case for any Western defence department.

Important changes that have occurred during the 1970s till the late 1980s suggest more emphasis on structural / organisational as well as simplification of decision-making processes. Concentration of nuclear industries (Minsredmash, the Ministry for Medium Machine Building, the euphemism

14. Jean Alexander, *Russian Aircraft Since 1940* (London: Putnam; 1975), p. 16.

of the past for nuclear weapons, was amalgamated with Minatomenergo, the Ministry for Atomic Energy) and other industries serve as an example of near comprehensive restructuring of the defence industry. On the other hand, the Ministry of Civil Aviation has been added, ending a long-term official secret that in the case of emergency, the transport capacities of Aeroflot would be added to the Soviet defence efforts. In a similar vein, the general significance of telecommunications for military preparedness is now officially admitted by the incorporation of Minpromsvyazi, the Ministry for Communication Equipment Industry, into the overarching complex of Minsvyazi, the Ministry of Telecommunications.

Out of the nine ministries responsible for defence industrial production, three ministries are directly related to the aerospace sector, although some other ministries have minor or indirect influences in the said sector. The Ministry for Aviation Industry (Minaviaprom) was established in 1939 and was amalgated with the Ministry for Defence Industry in 1953 for a brief time. Military products of this ministry include various types of combat aircraft and helicopters, missiles, tactical and strategic missile defence systems and anti-submarine missiles. The Ministry of General Machine Building (Minobchtchemash), among others is responsible for production of space vehicles. The Ministry of Civil Aviation, as the name suggests, is also related to the aerospace sector. Apart from these, the Ministry for Telecommunication and Ministry for Radio Industry are considered to be working closely for the overall aerospace sector.

THE RUSSIAN DEFENCE INDUSTRIAL SECTOR IN THE CONTEMPORARY TIMES

The dramatic disintegration of the Soviet Union and the collapse of the socialist system led to massive structural and institutional level transitions evident in almost each and every aspect of national life. The defence industrial sector was one of the worst affected—confronted with challenges ranging from structural/organisational problems to revival of the whole sector. Production suffered—most notably in the communications industry (40.8

per cent), armaments (25 per cent), radio (24.2 per cent) and electronics (24.9 per cent) during the period 1991-96[15]. At this time, the defence industrial sector consisted of over 1,800 enterprises and organisations and employed three million people. By 2002, the figures had changed dramatically—the number of enterprises had fallen below 1,600, while the number of workforce had fallen to below two million (See Table 3).

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The period 1991-97 witnessed a sharp decline in the military output of the Russian defence industry. The level of military production in 1997 was

Table 3: The Russian Arms Industry in 2002

		Type of Establishment			Type of Ownership			Labour Force
Industrial Sector	**Numbers**	**Industrial Enterprises**	**R&D Orgs.**	**Other**	**State**	**JSC(S)**	**JSC**	
Aviation	301	152	106	33	81	139	81	5,04,000
Missiles & Space	108	38	61	9	82	15	11	2,66,000
Electronics	293	178	96	19	79	91	123	1,56,000
Radio	308	160	115	33	99	72	137	1,67,000
Communi-cations	151	79	67	5	62	40	49	98,000
Shipbuilding	166	109	53	4	71	54	41	2,13,000
Armaments	128	63	54	11	53	45	30	3,29,000
Munitions	134	81	36	17	103	15	16	2,19,000
Total	1,589	860	588	131	630	471	488	19,52,000

Source: Julian Cooper, "The Arms Industries of Russian Federation, Ukraine and Belarus," *SIPRI Yearbook 2004* (Oxford: Oxford University Press, 2004), Appendix 11C, p. 432.

15. Ian Anthony, ed., *Russia and the Arms Trade* (London: Oxford University Press & SIPRI, 1998), p. 131

only 8.8 per cent of what it had been in 1991. This is not to suggest that drastic reductions were uniform across the branches of the defence industry. Electronics and communications equipment industries suffered the largest falls, almost 80 per cent, while shipbuilding, protected by foreign orders for civilian vessels, had a fall of only one-third[16]. It was only during the late 1990s that the military output recovered to a minor extent; it showed a marginal increase since 1998[17]. In this recovery, the most important sectors have been aerospace and shipbuilding that have registered growth, thanks primarily to export potentials as well as existing and upcoming orders.

The nine defence industrial ministries that administered the entire defence industry came under the Ministry of Industry, which was further disbanded in 1992 to pave the way for one State Committee for Industrial Policy and four committees for various sectors of the national defence industry. One of these committees was particularly for the defence industry[18]. President Yeltsin, in October 1992, approved the setting up of the Committee on Defence Industry (Roskomoboronprom) with eight departments of which Aviation Industry and Missile and Space Technology became important. Soon this committee was elevated to the status of State Committee on Defence Industry (SCDI) and was known as Goskomoboronprom. Some 2,500 defence industries, research institutes and design bureaus came under this committee. In 1996, this committee was upgraded to create a Ministry of Defence Industry (known as Minoboronprom) and further down the road it was dissolved and major functions of this ministry came under the Ministry of Economy.

After a series of reforms undertaken at the highest levels, the Russian defence industry was again reorganised along new administrative lines. In May 1999, the Russian defence industry was reorganised into five agencies under the policy leadership of the Ministry of Industry, Science and Technology. This arrangement lasted for about five years amid minor changes

16. *SIPRI Yearbook 1999* (Oxford: Oxford University Press, 1999), p. 391.
17. n. 13, p. 391.
18. Yevgeny Kogan, "Russian Defence Conversion and Arms Exports," *Peace Research Institute Frankfurt* (PRIF), Report No. 41, 1995. Also see, Baidya Bikash Basu, "Reforms in Russian Defence Industry: Problems and Prospects," *Strategic Analysis*, vol. XXIII, no. 10, January 2000, p. 1667.

here and there. In the new government formed in March 2004, the five agencies were dissolved into a new Federal Agency for Industry, headed by Aleshin[19]. The new agency is expected to be compact, with a staff of less than 200[20]. In March 2003, President Putin decreed the formation of an additional agency, the State Committee of the Russian Federation for the Defence Order, which is attached to the Ministry of Defence (MoD). This committee has an authorised staff of about 300 and in March 2004, it was renamed the Federal Service for the Defence Order. The MoD has gained additional powers in the field of arms exports. In December 2000, a new Committee of the Russian Federation for Military–Technical Cooperation with Foreign States (KVTS) was created. By a decree of November 2003, the state arms exports company, Rosoboroneksport, lost its independence. It was subordinated to KVTS. In addition to this, six companies, including the MiG and Tula design bureaus, retained independent exports rights. Following a decree of November 2002, 15 companies now have the right to engage independently in exports activities[21].

By the end of 2003, total defence industry output reached approximately 50 per cent of the 1991 level, with military output reaching up to 40 per cent of the 1991 level.

The overall output of the Russian defence industry has been growing at a steady pace since 1998-99. By the end of 2003, total defence industry output reached approximately 50 per cent of the 1991 level, with military output reaching up to 40 per cent of the 1991 level. Although the growth has been uneven between sectors, the annual changes are influenced heavily by exports opportunities. For example, the aerospace sector (Rosviakosmos) accounted for 52.5 per cent (largest share) in total exports in the year 2000, which jumped to 75.9 per cent in 2001. By 2003, it contributed to 75 per cent

19. Julian Cooper, "The Arms Industries of the Russian Federation, Ukraine and Belarus," in *SIPRI Yearbook 2004* (Oxford: Oxford University Press; 2004), Appendix 11C, p. 431.
20. Details of this agency, including its functions and roles, are available at <http://www.rasu.ru>
21. For details, see notes available at <http://www.mfit.ru/defensive/obzor/ob11-12-03>

of the total exports[22]. Thus, it is generally agreed that the aerospace industry has fared well in recent years.

The framework of the State Defence Order (SDO, in the Russian Gosudarstvennyi Oboronnyi Zakaz—GOZ) undertakes the responsibility of all defence industrial companies for meeting the needs of the MoD. In 2003, it undertook a large futuristic state armaments programme for 2006-15, while the current programme in force is for the period 2001-10. The 2004 agenda of the SDO includes some procurement of new and modernised weapons, including the Topol-M strategic missiles, six military space systems, Tu-160 strategic bombers, T-90 MBTs, and Su- 27 fighters. Presumably, it also includes funding for the principal project of the aviation industry: the development of a new fifth generation combat aircraft. Sukhoi is the lead organisation but it will work with MiG, although there is a possibility that they will merge to form a single design bureau and corporation[23].

The restructuring of the aerospace sector in Russia falls under the broader policy goal for the defence industry.

The restructuring of the aerospace sector in Russia falls under the broader policy goal for the defence industry. This has been going on for quite a while. The current restructuring programme is one promoted by the former Industry Minister Ilya Klebanov: the federal programme for the reform and development of the military-industrial complex, 2002-06, adopted by the government in October 2001. The original goal of this programme was to form, by 2006, nearly 75 corporations (out of which 19 were in the aviation industry), incorporating more than 520 enterprises[24]. It was also envisaged that in the period 2006-10, there would be a further round of consolidation efforts to create a few large corporations across specific sectors like aerospace, missiles and naval.

22. See Table 11C.3, *SIPRI Yearbook 2004*, p. 434.

23. n. 13, p. 438.

24 Details of this programme are available at <http://www.i.vpk.ru/rst/integr/fpgplan>

TRENDS IN DEFENCE INDUSTRIAL COLLABORATIONS AND EXPORTS

In the field of privatisation efforts, one of the most significant developments has been the NPK (Nauchno Proizvodstvennaya Korporatsia) Irkut, led by the Irkutsk aviation works, one of the most successful of the Russian companies. Irkut, which builds modernised export versions of the Su-30 and Su-27 fighters and the Be-200 amphibious search and rescue aircraft, has controlled stakes in the Taganrog Beriev aviation company and the Russkaya Avionika design bureau and will soon take a 75 per cent stake in the Yakovlev design bureau[25]. Irkut is also planning a London Stock Exchange listing by mid-2005 and is likely to be the first Russian defence company to be so listed. The Yakovlev design bureau is responsible for the design of the Yak-130, which has been adopted by the air force for its future basic trainer. It will be built by the Nazhnii Novgorod Sokol works, which is controlled by the private Kaskol company, one of the most important firms in the Russian aerospace sector. The Yakovlev, it is reported, is developing cooperation with the European Aeronautic Defence and Space Company (EADS)[26].

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In recent times, the Russian government has been contemplating a major restructuring of the defence industry, especially its aerospace sector. According to a reform concept by Rosaviakosmos, the Russian Aviation and Space Agency has outlined radical steps to create a giant aerospace consortium along the lines of EADS of Europe[27]. The consortium, dubbed the Unified Aircraft Building Co., or OAK, would fully emerge as a single-share entity by 2007 and include such brand names as Sukhoi, MiG, Irkut,

25. *The Moscow Times*, May 14, 2004, available at <http://www.themoscowtimes.ru>
26. n. 13, pp. 440-41.
27. "Aviation Industry to Go Private," *The Moscow Times*, December 1, 2003, available at <http://www.avia.ru/english/articles/doc>

Ilyushin and Tupolev. OAK would be controlled by private capital, with the state holding a stake of 25.5 per cent. It would encourage international cooperation in all stages of the production cycle, from design and development to post-sale servicing. Eurocopter, the world's leading helicopter manufacturer, is reportedly in talks with Irkut to manufacture its choppers in Russia[28]. Irkut wants to assemble Eurocopter's single engine EC-120 and twin-engine EC-130. Eurocopter's previous involvement in the Russian defence industry includes Euromil, a three-way venture with KVZ (Kazan Helicopter Plant, which produces the nine seat, 520 km Ansat) and Moscow's Mil, that was set up in 1994 to develop, produce and market the Mi-38 multipurpose medium-lift chopper. As mentioned earlier about Yakovlev's collaborative efforts with EADS, there are reports about joint efforts between the European aerospace giant, Sukhoi Co. and Russia's main arms exporting agency Rosoboronexport, to produce a wide range of military products[29]. With the agreement signed in 2001 between Rosaviakosmos and EADS, Airbus, which is 80 per cent owned by EADS, has opened an engineering centre at Moscow with the domestic industrial group Kaskol. EADS has also offered Nizhny Novgorod's Hydromash plant the chance to make undercarriages for Europe's A400M military transport aircraft.

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Russia's quest for international defence industrial collaborative efforts with major centres of arms production like Europe is well complemented by its traditional ties with the People's Republic of China (PRC), the latter which not only maintains frontline status as the biggest arms importer from Russia but also is increasingly seen as a major defence industrial partner in recent times. The PRC has been the world's largest importer of arms. In

28. "Eurocopter Eyes Making Choppers in Russia," *The Moscow Times*, October 24, 2003,
29. "Russia, Europe Sign Pacts on Arms," *The Moscow Times*, June 18, 2003.

2001, its arms imports were calculated to exceed $ 3 billion. China is believed to have purchased nearly $12 billion worth of arms during the period 1992 to 2002. The U.S. Congressional Research Service estimated that PRC arms imports were worth $ 3.6 billion in 2002, with 'signed deals' to import $17.8 billion worth of arms from 1995 to 2002[30]. The major ongoing People's Liberation Army (PLA) weapons purchase packages include some 400 Sukhoi fighters, thousands of Russian anti-air and precision ground-attack weapons, many hundreds of S-300 SAMs, 12 Kilo class submarines (eight with Club long-range anti-ship missiles, four Sovremenny class destroyers, three new classes of stealth warships, and 40 to 50 Il-76 heavy transport aircraft among others[31].

Since the early 1990s, access to Russian weapons and military technology has had a profound impact on the current PLA modernisation efforts. All the PLA services, to varying degrees, rely on Russian technology to help fulfill modernisation goals. Russian technology enabled the PLA's first manned space flight to perform military reconnaissance in October 2003, and would enable future PLA radar surveillance satellites. Sukhoi-27s and Sukhoi-30 fighters, when combined with Russian precision guided munitions (PGM), A-50 AWACS (airborne warning and control system) and reconnaissance satellites, are giving the PLA Air Force (PLAAF) its first all weather strike capability. Russian technology and assistance enabled the PLA Navy (PLAN) to launch its first second-generation Type 093 SSN in 2002, which will form the basis for the PLAN's second-generation Type 094 SSBN. The purchase of 12 Kilo class submarines, with the prospects for co-production of 20 more, could give the PLA the largest fleet of modern SSKs in Asia. Apart from these, the Russian weapons and technology purchased

30. Ray Cheung, "China's Arms Deals Topped US $ 3.6 Billion," *South China Monitoring Post*, September 27, 2003.

31. "Foreign Military Acquisitions and PLA Modernisation," written testimonies of Richard D. Fisher, Jr., Centre for Security Policy, before the U.S.-China Economic and Security Review Commission, dated February 6, 2004, available at <http://www.uscc.gov/hearings/2004hearings/written_testimonies/04_02_06wrts/fisher.htm>

by the PLA have helped modernise the PLA's main battle tanks, armoured personnel carriers, amphibious tanks, airborne tanks and anti-tank missiles.

There is evidence of increasing emphasis on broader technology development cooperation, in which the PRC seeks to attract Russian technological investment in the PRC and the PRC also invests in high technology in Russia. In 1993, there were 300 Russian scientists on long-term defence related programmes, and by 2000, the number had crossed 1,500. High technology development contracts between the two countries jumped from 35 contracts, totalling $11.7 million in 2001 to $20.7 million for 30 contracts in the first half of 2002. A 2002 PRC technology delegation visiting Moscow to advance these contracts included officials from leading shipbuilding, nuclear energy, aerospace and defence industrial units. Long seeking to shift the balance of its military trade from hardware to technology, the PRC Defence Minister Cao Gangchuan made a special push to change the balance to 70 per cent technology and 30 per cent balance[32]. Of particular note is the PLA's willingness to participate in joint sales to third countries as well as joint collaborations with countries other than Russia. Europe perhaps comes in the latter list of priorities.

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CONCLUSIONS

The Russian defence industry is in transition. From a frontline supplier of military weapons during the Cold War era, it faced near collapse and an uncertain future scenario during the initial years of the post-Cold War period, when almost all aspects of national life were in disarray. With military expenditure and domestic procurement plummeting considerably in the 1990s, and, more importantly, both institutional and organisational problems

32. Ibid.

impinging the health of this once robust defence industry, the country's top political and industrial leadership commenced the repair job. Amid all difficulties, the apparent revival of the defence industry, thanks primarily to increasing military exports, commenced during the late 1990s. Coupled with a series of institutional and organisational changes during the whole of the 1990s and pursued well into the early years of the 21st century, the Russian defence industry is slowly limping back to normalcy, although problems of varying magnitude remain to be addressed.

China, which has aggressively pursued policies of joint collaboration efforts in the field of military technology with Russia for quite some time.

Some major trends in the Russian defence industry have been noticeable in recent times. First, a series of structural and policy related goals have been initiated and implemented during the last fifteen odd years. These initiatives have been undertaken at the most difficult times in the history of Russia and are aimed primarily at stabilisation of institutions within the defence industrial sector. Privatisation, conversion, diversification and internationalisation are some of the approaches adopted by the Russian defence industry in recent times with mixed results. These initiatives are likely to continue well into the future. Second, within the structural reforms, the defence industry is showing increasingly a trend toward consolidation of industrial units. A case in point is the aerospace sector where the trend of consolidation is most visible. As noted earlier, the trend toward further consolidation is likely to continue, which may eventually see the emergence of some Russian defence giants in the future. Third, Russia's aggressive military exports suggest that countries like China and India are likely to receive the bulk of the military hardware, a trend likely to continue well into the future. Fourth, related to exports, the trend of Russian technologies flowing into other countries is also likely to grow. A case in point is China, which has aggressively pursued policies of joint collaboration efforts in the field of military technology with Russia for quite some time. China's quest for more mature joint production efforts with Russia in recent times needs

a closer look. Fifth, Russia's new initiatives to boost its defence industrial collaborations with countries in Europe is a new trend. Collaborative projects with aerospace giants like EADS suggest that such efforts are going to be long-term ones. Such a trend needs to be of the examined closely. Sixth, related to such internationalisation efforts, one may also notice the slow emergence of a possible Russia-China-Europe trilateral defence industrial cooperation in future. China's new found love for Europe, the latter's easing of arms embargoes toward the former, Russia's defence industrial initiatives toward both China and Europe, and China's aggressive pursuit of Russia-Chinese defence industrial collaborations—all these suggest that the three major centres of arms production seem to be coming closer to each other, impacts of which could be felt some time in the future. And, lastly, given Russian willingness to open up the defence sector, one may witness the reemergence of a fairly competitive arms merchant in the future, that may to some degree, challenge the existing status of the United States, although it is still a distant dream. ■